CLAIM

1. An exposure method comprising the steps of:

measuring an image placement of a mask at an inversion posture against an exposure posture;

correcting said measured image placement with considering a pattern displacement caused by gravity at the exposure posture to prepare a first correction data based on a difference between a corrected image placement and a design data; and

performing an exposure by deflecting charged particle beam based on said first correction data to correct a position of a pattern to be exposed to a subject.

2. An exposure method as set forth in claim 1, wherein a transfer function indicating an interrelation of the pattern displacement caused by gravity at the exposure posture and the inversion postures is prepared by using a test mask in advance, and

said measured image placement is corrected by using said transfer function.

3. An exposure method as set forth in claim 1, wherein said mask is provided with a pattern for measuring a placement precision which differs from said pattern to be projected to said subject, and

the step of measuring the image placement of said

mask comprises measuring a position of said pattern for measuring the placement precision of said mask.

4. An exposure method as set forth in claim 1, before the step of performing the exposure further comprising:

measuring a curved shape of said mask at the exposure posture; and

preparing a second correction data indicating a displacement of the image placement caused by a curved shape of the respective masks at the exposure posture based on said measured curved shape, wherein

the step of performing the exposure includes performing the exposure by deflecting charged particle beam based on said first correction data and said second correction data to correct the position of the pattern to be exposed to said subject.

5. An exposure method as set forth in claim 4, wherein the step of preparing said second correction data comprises preparing said second correction data indicating the displacement of said image placement based on a difference of the curved shape of a test mask at the exposure posture measured in advance and the curved shape of said measured mask.

6. An exposure method as set forth in claim 4, wherein the step of preparing said second correction data comprises preparing a plurality of said second correction

data indicating the displacement of said image placement at the exposure posture by using a plurality of the test masks having a different curved shape each other and storing a plurality of said second correction data to a database, and

reading out said second correction data from said database and utilizing said second correction data which is corresponding to said test mask having closest curved shape in comparison with said curved shape of said measured mask.

7. An exposure method as set forth in claim 1, wherein a stencil mask is used as said mask.

8. An exposure method as set forth in claim 1, wherein electron beam is used as said charged particle beam.

9. A semiconductor device manufacturing method having an exposure step of projecting a pattern to a semiconductor device by irradiating charged particle beam via a mask, said exposure step comprising the steps of:

measuring an image placement of said mask at an inversion posture against an exposure posture;

correcting said measured image placement with considering a pattern displacement caused by gravity at the exposure posture to prepare a first correction data based on a difference between a corrected image placement and a design data; and

performing an exposure by deflecting charged particle beam based on said first correction data to correct a position of a pattern to be exposed to a subject.

10. A semiconductor device manufacturing method as set forth in claim 9, wherein a transfer function indicating a relation of the pattern displacement caused by gravity at the exposure posture and the inversion postures is prepared by using a test mask in advance, and

said measured image placement is corrected by using said transfer function.

11. A semiconductor device manufacturing method as set forth in claim 9, wherein said mask is provided with a pattern for measuring a placement precision which differs from said pattern to be projected to said subject, and

the step of measuring the image placement of said mask comprises measuring a position of said pattern for measuring the placement precision of said mask.

12. A semiconductor device manufacturing method as set forth in claim 9, before the step of performing the exposure further comprising:

measuring a curved shape of said mask at the exposure posture; and

preparing a second correction data indicating a displacement of the image placement caused by a curved

shape of the respective mask at the exposure posture based on said measured curved shape, wherein

the step of performing the exposure includes performing the exposure by deflecting charged particle beam based on said first correction data and said second correction data to correct the position of the pattern to be exposed to a subject.

13. A semiconductor device manufacturing method as set forth in claim 12, wherein the step of preparing said second correction data comprises preparing said second correction data indicating a displacement of said image placement based on a difference of the curved shape of a test mask at the exposure posture measured in advance and the curved shape of said measured mask.

14. A semiconductor device manufacturing method as set forth in claim 12, wherein the step of preparing said second correction data comprises:

preparing a plurality of said second correction data indicating the displacement of said image placement at the exposure posture by using a plurality of the test masks having a different curved shape each other and storing a plurality of said second correction data to database, and

reading out said second correction data from said database and utilizing said second correction data which is corresponding to said test mask having closest curved

shape in comparison with said curved shape of said measured mask form.

15. An exposure apparatus comprising:

a correction data preparation means for correcting an image placement of a mask at an inversion posture against an exposure posture with considering a pattern displacement caused by gravity during exposure to prepare a first correction data based on a difference between a corrected image placement and a design data; and

a charged particle beam irradiation means for performing an exposure by deflecting charged particle beam based on said first correction data to correct a position of a pattern to be exposed to a subject.

16. An exposure apparatus as set forth in claim 15, wherein said correction data preparation means corrects the image placement by using a transfer function indicating an interrelation of the pattern displacement caused by gravity at the exposure posture and the inversion posture.

17. An exposure apparatus as set forth in claim 15, wherein said mask is provided with a pattern for measuring a placement precision which differs from said pattern to be exposed to said subject, and

said correction data preparation means prepares said first correction data based on the position of the pattern for measuring a placement precision of said mask.

18. An exposure apparatus as set forth in claim 15, further comprising a mask shape measurement means for measuring a curved shape of said mask at the exposure posture, wherein:

said correction data preparation means further prepares a second correction data indicating a displacement of the image placement caused by a curved shape of the respective masks at the exposure posture based on said measured curved shape, and prepares a correction data based on said first correction data and said second correction data, and

said charged particle beam deflection means deflects charged particle beam based on said correction data.

19. An exposure apparatus as set forth in claim 18, wherein said correction data preparation means prepares said second correction data indicating the displacement of said image placement based on a difference of the curved shape of a test mask at the exposure posture measured in advance and the curved shape of said measured mask.

20. An exposure apparatus as set forth in claim 18, further comprising a memory means for storing a plurality of said second correction data indicating the displacement of said image placement at the exposure posture with respect to a plurality of the test masks

having a different curved shape each other, wherein

said correction data preparation means reads out said second correction data from said memory means and utilizes said second correction data which is corresponding to said test mask having closest curved shape in comparison with said curved shape of said measured mask.